

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

# Mathematical Tools

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# Prerequisites

- Matrix Algebra
- Basic use of computer

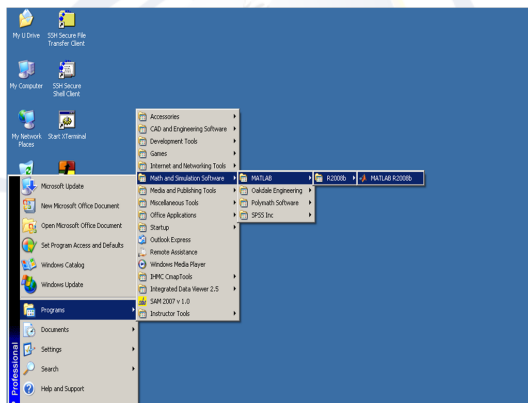
# Marks Distribution

- Mid term = 15 Marks
- Presentation = 10 Marks
- Quiz = 10 Marks
- Assignments = 10 Marks
- Class Activities = 5 Marks

# Basic ideas

## Open MATLAB

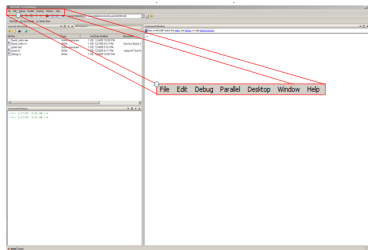
Programs>Math and Simulation Software>MATLAB>R2008b>MATLAB R2008b



# Basic ideas

## Menu Bar

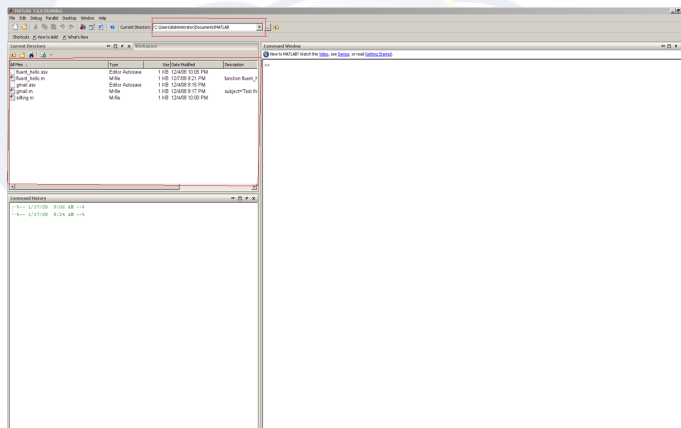
Contains the commands you can use to perform certain tasks



# Basic ideas

## Current Directory

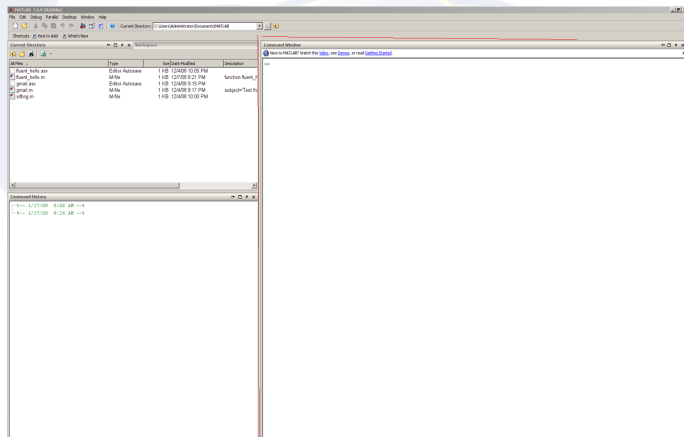
Shows the active directory



# Basic ideas

## Command Window

This is where the variables, and MATLAB commands are entered

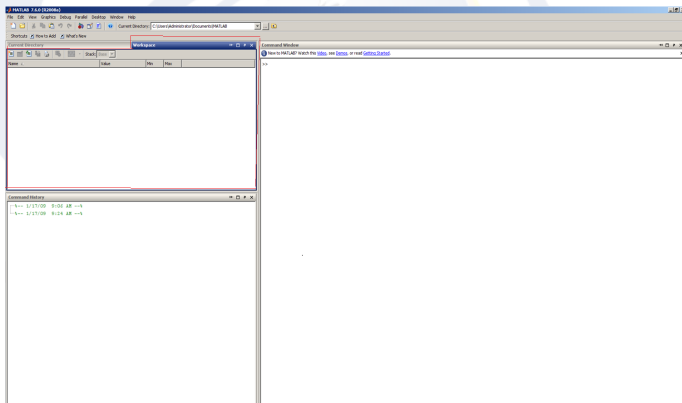




# Basic ideas

## Workspace

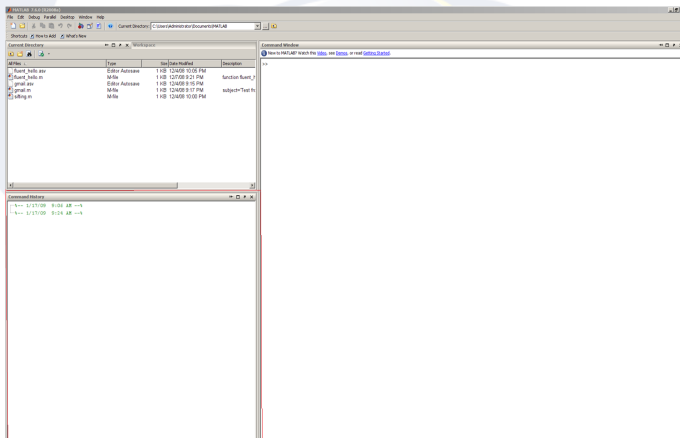
Creates, imports, displays the name, value, min, and max size of the variables



# Basic ideas

## Command History Window

Shows the time/date at which commands were issued



# Basic ideas

To get started, type one of these commands: `helpwin`, `helpdesk` or `demo`

The various form of help available are

- helpwin**      Opens a MATLAB help GUI
- helpdesk**    Opens a hypertext help browser
- demo**        Starts the MATLAB demonstration

The complete demonstration of MATLAB can be accessed from the hypertext helpdesk. For example, clicking the link [Full Documentation](#)

# Basics of MATLAB

To get MATLAB to work out  $1+1$ , type the following at the prompt:

```
1+1
```

MATLAB responds with

```
ans=
```

```
2
```

The answer to typed command is given the name **ans**. In fact **ans** is now a variable that you can use again. For example you can type

```
ans*ans
```

To check that  $2 \times 2 = 4$ :

```
ans*ans
```

```
ans=4
```

# Variable Declaration

Variables in MATLAB are named objects that are assigned using the equal sign `=`. They are limited to 31 characters and can contain upper and lower case letters, any number of '-' characters and numerals.

MATLAB is case sensitive: **A** and **a** are different variables. The following are the valid variables

`a=1`

`speed=1500`

`BeanFormeroutputType = V * Q * V`

`name='Johan Smith'`

These are invalid assignments

`2for1='yes'`

`first one=1`

# Colon Operator

To generate a vector of equally spaced elements MATLAB provides the Colon operator. Try the following commands:

```
1:5
```

```
0:2:10
```

```
0:.1:2*pi
```

The syntax  $x : y$  means roughly "generate the ordered set of numbers from  $x$  to  $y$  with increment 1 between them". The syntax  $x : d : y$  means roughly "generate the ordered set of numbers from  $x$  to  $y$  with increment  $d$  between them".

## Using MATLAB as a calculator

let's suppose you want to calculate the expression,  $1 + 2 * 3$ . You type it at the prompt command (`>>`) as follows,

```
>> 1 + 2 * 3
```

```
ans =
```

```
7
```

# Using MATLAB as a calculator

SYMBOL	OPERATIONS	EXAMPLE
+	Addition	$3+2$
-	Subtration	$50-30$
*	Multiplication	$8*9$
/	Division	$2/3$



## Overwriting variable

Once a variable has been created, it can be reassigned. In addition, if you do not wish to see the intermediate results, you can suppress the numerical output by putting a semicolon (;) at the end of the line. Then the sequence of commands looks like this:

```
>> t = 5;  
>> t = t + 1  
t =  
6
```

## Error messages

If we enter an expression incorrectly, MATLAB will return an error message. For example, in the following, we left out the multiplication sign,  $*$ , in the following expression:

```
>> x = 10;
```

```
>> 5x
```

```
??? 5x
```

```
|  
Error: Unexpected MATLAB expression.
```

# Making corrections

To make corrections, we can, of course retype the expressions. But if the expression is lengthy, we make more mistakes by typing a second time. A previously typed command can be recalled with the up-arrow key  $\uparrow$ . When the command is displayed at the command prompt, it can be modified if needed and executed.

# Controlling the hierarchy of operations or precedence

Let's consider the previous arithmetic operation, but now we will include parentheses. For example,  $1 + 2 \times 3$  will become  $(1 + 2) \times 3$

>>  $(1 + 2) * 3$

ans =

9

# Controlling the hierarchy of operations or precedence

Precedence	Mathematical operations
First	The contents of all parentheses are evaluated first, starting from the innermost parentheses and working outward.
Second	All exponential are evaluated, working from left to right
Third	All multiplications and divisions are evaluated, working from left to right
Fourth	All additions and subtractions are evaluated, starting from left to right

## Controlling the hierarchy of operations or precedence

For operators of equal precedence, evaluation is from left to right.  
Now, consider another example:

$$\frac{1}{2 + 3^2} + \frac{4}{5} \times \frac{6}{7}$$

In MATLAB, it becomes

```
>> 1/(2 + 3^2) + 4/5 * 6/7  
ans = 0.7766
```

or, if parentheses are missing,

```
>> 1/2 + 3^2 + 4/5 * 6/7  
ans = 10.1857
```

Therefore, we want to emphasize the importance of precedence rule in order to avoid ambiguity.

# Questions

